Original Article

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Effect of Perioperative Music Therapy/Medicine on Postoperative Pain in Women Undergoing Elective Lower Segment Caesarean Section Delivery under Spinal Anaesthesia: A Case-control Study

Anaesthesia Section

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ABSTRACT

Introduction: Women undergoing elective Lower Segment Caesarean Section (LSCS) delivery under spinal anaesthesia usually experience anxiety and stress due to unpleasant operative environment. Music therapy medicine has been found to relieve anxiety and stress besides decreasing pain and stable cardiorespiratory parameters.

Aim: To assess the effect of perioperative music therapy medicine on pain and cardiorespiratory parameters in women undergoing elective LSCS under spinal anaesthesia.

Materials and Methods: The present study was case-control study in which 60 consecutive parturient women, planned for elective LSCS delivery under spinal anaesthesia, were randomly divided into music and non music groups of 30 each. Demographic characteristics of women were recorded. The 'music group' received preselected music three times for 20 minutes each along with standardised analgesia protocol. The 'non music group' received standardised analgesia protocol only. Respiratory and haemodynamic parameters were assessed during perioperative period. Postoperative pain was assessed using Visual Analogue Scale (VAS) scores in addition to comparisons of time for rescue analgesia between study and control groups. Statistical differences were derived using Mann-Whitney U-test.

Results: Demographic characteristics of women were statistically insignificant. Significant differences were observed in Heart Rate (HR) at 30, 45 and 60 minutes Postanaesthesia Care Unit (PACU) (p-value 0.0278, 0.0151 and 0.02852, respectively) and Respiratory Rate (RR) at 60 minutes PACU (p-value 0.04884). This study found beneficial effect of music on pain as assessed by VAS in the postoperative period. Beneficial effect of music on pain observed in study group vs. controls at 1 hour (0.64 vs. 1.51), 2 hours (1.88 vs. 2.76) and 3 hours (3.07 vs. 3.47) of PACU stay (p-value 0.0003, 0.00152 and 0.02444, respectively). The study also detected a significant delay (29 minutes) in time for first rescue analgesia in music group (p-value 0.01732).

Conclusion: Music therapy/medicine during elective LSCS delivery is beneficial on HR, respiratory rate, VAS and time to rescue analgesia.

Keywords: Haemodynamic parameters, Postanaesthesia care, Rescue analgesia, Stress and anxiety, Visual analogue scale scores

INTRODUCTION

The variability in pain perception is linked with individual differences in biological variables as well as psychosocial variables [1]. Psychological factors like social support, hypnotism, meditation or distraction can significantly affect intensity of pain [2]. LSCS is one of the most common surgical procedures in obstetrics. Majority of LSCS delivery are planned/elective and carried out mostly under spinal anaesthesia. Women undergoing elective LSCS under spinal anaesthesia usually experience stress and anxiety due to thinking about the surgical procedure before, during and after LSCS delivery [3,4]. Studies have reported adverse effects of maternal stress and anxiety on baby later in life [5,6]. In addition, stress and anxiety can affect pain perception and the usage of analgesics affects lactation postoperatively [7]. It is also necessary that pain relief should be safe and effective, that should not interfere with the mother's ability to care her baby and that it results in no adverse neonatal effects in breastfeeding women [8].

In view of the limited pharmacological options of intervention available for gravid women, the health professionals look for alternative low-risk approaches to decrease anxiety, stress and pain associated with LSCS delivery. One non pharmacological intervention is the use of music to reduce anxiety and pain in surgery. Music is a known non pharmacological, inexpensive and non invasive method without side-effects that has been shown to reduce postoperative pain and anxiety as shown by various researchers [9-11]. Music therapy/medicine is a safe adjuvant to regional/spinal anaesthesia for elective LSCS [12]. Perioperative music interventions can modulate response to stress [13,14] and reduce sedative requirements [15].

Music reduces or eliminates awareness during spinal anaesthesia [16]. The principle of music therapy/medicine is based on the fact that while pain stimuli are occurring, the central nervous system is also receiving other stimuli. The central nervous system processes a limited number of messages at the same time, and these sensations compete with pain stimuli. Therefore, if consciousness and awareness (attention) can be focused on a strong, positive stimulus such as music, then perception of pain could be attenuated [17]. Music reduces anxiety through activation of auditory pathways and limbic system. These communicate with hypothalamus, reticular activating system and hippocampus to attenuate excitatory neurotransmitters leading to relaxation and beneficial effects. In addition, music also distracts brain and also activates parasympathetic system [9]. Various authors also have studied the level of hormones and neurotransmitters while listening to music. They showed that music lowers hormones like cortisol, adrenocorticotrophic hormone and catecholamines but increases oxytocin as well as serotonin [18,19]. Oxytocin has a boosting effect on psychological condition of the parturient women whereas serotonin lowers pain, stress and anger.

Music also induces alterations in endorphin levels, which has role in relieving stress and pain [20].

Several studies have examined the possibility of using music to benefit the patient but outcome was conflicting. Some studies found beneficial effects [9-12,21] whereas others could not [22,23]. Further, most of the studies used music only once, either preoperative, intraoperative or postoperative or mainly with general anaesthesia and few with regional anaesthesia, in particular LSCS [23]. Moreover, these lacked scientific rigour regarding music selection, study framework, involvement of musical experts, and patients' etc. Hence, role of music as multimodal approach in controlling pain and/or anxiety is inconclusive, and there was a need for a study that can provide robust scientific evidence regarding the effects of music therapy/medicine, especially in association with LSCS.

MATERIALS AND METHODS

This case-control study was conducted in the Department of Anaesthesiology, Atal Bihari Vajpayee Institute of Medical Sciences and Dr RML Hospital, New Delhi, India from November 2018 to March 2020. Institutional Ethics Committee (IEC) approval was obtained before starting the study {F.No.TP(MD/MS)(29/2018)/IEC/PGIMER/RMLH}.

Inclusion criteria: All parturient women for elective LSCS delivery having American Society of Anaesthesiologists (ASA) physical class II were included into the study.

Exclusion criteria: Those with co-morbidities like hepatic, renal, cardiac and respiratory diseases or psychiatric illnesses such as depression, anxiety, neurosis or allergic to drugs, local anaesthetics or hearing impaired or having tinnitus and vertigo were excluded from the study.

Sample size calculation: The sample size was calculated based on a published study [24] that observed mean pain score in music group to be 27±21 and in control group to be 46±23. With these values as reference, the minimum required sample size with 90% power of study and 5% level of significance was 29 patients in each study group. Hence, 60 adult parturient undergoing elective LSCS delivery under spinal anaesthesia were enrolled prospectively for the study.

Formula used for comparing mean of two groups:

$$N \geq 2 \frac{(\text{standard deviation})^2}{(\text{mean difference})^2} \times (Z_\alpha + Z_\beta)^2$$

Where, Z_α was value of Z at two-sided alpha error of 5% and Z_β was value of Z at power of 90% and mean difference was difference in mean values of two groups.

Pooled standard deviation=square root {(21×21+23×23)/2}=22.02

$n \geq (2 \times 22.02 \times 22.02 \times (1.96+1.28)^2)/(46-27)^2 = 28.20 = 29$ (approx.)

A total of 30 women were in the 'music group' whereas, another 30 in the 'non musical group' were enrolled.

Study Procedure

All women on the evening before day of elective LSCS delivery underwent thorough preoperative evaluation along with written consent after thorough explanation about the study. Once patient was enrolled, randomisation of the case was carried out using computer generated random number table to either as music or non music, 30 patients in each group. At this point of time, baseline parameters of HR, Blood Pressure (BP), Oxygen Saturation (SpO_2) and RR were recorded. Patient in music group, was asked about personal preferred choice of music. If patient had no such particular preference, she was asked to opt one from vocal (Indian classical, semi-classical, folk and light music) or instrumental (single or mixed musical instruments) lists. The patient in music group was given a brief test music of approximately two minutes prior to starting study to assess her acceptability of music and its volume.

On the morning of day of LSCS, in the preoperative area patients were examined approximately one hour before the scheduled time of surgery. The privacy, secrecy, proper isolation and minimal external disturbances along with calm and quite atmosphere in the preoperative area were ensured. Standardised analgesia protocol used in the study was injection paracetamol (15 mg/kg i.v. over 15-20 minutes) and tramadol (1 mg/kg i.v. or 50 mg/mL over 10 minutes) to all women during LSCS delivery. Selected music (about 20 minutes each) was administered through head phones during preoperative, intraoperative and postoperative period along with standardised analgesia protocol to all music group women. An 18-gauge IV canula was secured and IV fluid (Normal Saline/ringers' Lactate (NS/RL)) was infused to keep vein open and vitals were monitored.

The patient was then shifted to the Operation Theatre (OT) and was placed in supine position. Oxygen was given at the rate of 4 L/min through venturi mask. A wedge was placed below the right buttock and co-loading of IV fluid (RL/NS) was initiated. As per ASA standards, monitors for Non Invasive Blood Pressure (NIBP), continuous Electrocardiographic (ECG) with HR, pulse oximetry and RR were connected and continuous monitoring was carried out. Then patient was positioned for Sub-Arachnoid Block (SAB) in sitting or left lateral position. Under all aseptic precautions as per standard institutional practice, SAB for sensory level T6-T4 was given using 2.5-3.0 mL of Bupivacaine (Heavy, 5 mg/mL solution) including Fentanyl 12.5 µg (0.2 5 mL, 50 µg/mL) through a 25/26 G spinal needle at L3-L4 intervertebral space. Immediately after drug administration in sub-arachnoid space, patient was made supine. Once the desired level of anaesthesia (level T6-T4) was achieved and vital parameters were normal, LSCS was allowed to proceed. At this point of time, patient of music group listened to the music for 20 minutes and control group did not listen to music. Vitals were monitored and oxygen therapy/medicine as well as IV fluids infusion continued throughout as per anaesthesia practice for LSCS. Any of the anaesthetic complications occurring during surgery was managed timely and accordingly. Once surgery was over patient was shifted to PACU for continued monitoring and receiving standardised analgesia care protocol.

In the PACU, postoperative vitals were continuously monitored. Approximately 90 minutes after Sub Arachnoid drug Injection (SAI) i.e., 0-minute vitals were noted and the following standardised analgesia protocol was given for both the groups:

1. Inj. Paracetamol 15 mg/kg IV (10 mg/100 mL) over 15-20 minutes
2. Inj. Tramadol Hydrochloride 1 mg/kg IV (50 mg/mL) over 10 minutes
3. Inj Ondansetron 0.1 mg/kg IV slowly, as antiemetic.

Simultaneously with above drug infusion, the patients of music group listened to music for 20 minutes while patients of control group continued to rest. Monitoring was done for VAS scores and recorded every 10, 20, 30, 45, 60 minutes and subsequently every one hour approximately up to 5-6 hours till second dose of analgesia was needed {or when goes more than 30/100 (NRS) or 3/10 (VAS)}. The study was ended once second analgesic dose was given and time of receiving this second dose of analgesia was noted. Any breakthrough pain even after 1-1.5 hours of receiving standardised analgesia protocol medications was treated with rescue analgesia i.e., Tramadol Hydrochloride 0.5 mg/kg/IV. In patients having known allergy to tramadol hydrochloride, Inj. diclofenac sodium was given instead, in a dose of 1.0 mg/kg IV (25 mg/mL).

The data of the study documented were, vital parameters like HR, NIBP (systolic, diastolic and mean blood pressure), RR, SpO_2 and pain assessment using- (VAS; 0=no pain and 10=max possible pain), Verbal Rating Scale (VRS; none-mild-moderate-severe pain) and NRS (Numeric Rating Scale; 0-100). The VAS <3 was considered as pain under control [25,26].

STATISTICAL ANALYSIS

Categorical variables are presented in number and percentage (%) and continuous variables as mean±Standard Deviation (SD). Statistical differences between music and non music were derived using Mann-Whitney U-test (two-tailed) method. Predictive values were also evaluated with the use of the Receiver Operating Characteristic (ROC) curve analysis using XLSTAT 2020.2.3.65349-ROC Curves; free trial version. A p-value of ≤0.05 was considered statistically significant.

RESULTS

The demographic characteristics like age, Period Of Gestation (POG) at LSCS, number of pregnancy (gravida), Body Mass Index (BMI) and associated co-morbidities were similar between music and non music groups [Table/Fig-1]. The p-value between groups was 0.72 for age, 0.44 for POG, 0.99 for gravida, 0.18 for BMI and 0.96 for co-morbidity. On comparing the respiratory parameters like RR and SpO_2 in perioperative period (pre, intra and postoperative periods), the study did not observe any statistical differences between the two groups [Table/Fig-2,3] except RR at 60 minutes postcaesarean section in PACU (p=0.04884). Similarly, perioperative cardiovascular parameters (HR, systolic and diastolic blood pressure and mean arterial blood pressure) showed statistical differences in HR at 30,45 and 60 minutes post LSCS PACU [Table/Fig-4-6].

Characteristics	Age (years)	POG* (weeks)	Gravida	Co-morbidity+	BMI# (kg/m²)
Music group (n=30) (mean±SD)	28.4± 4.825	37.33± 1.373	1.9± 1.184	15	28.983± 4.959
Control group (n=30) (mean±SD)	27.2± 3.671	37.466± 1.888	1.833± 1.085	6	27.406± 4.437
Mann-Whitney U-Test (2 tailed) Z score	0.34743	-0.7614	0.00739	0.03892	1.31581
p-value	0.7263	0.44726	0.99202	0.9681	0.18684

[Table/Fig-1]: Shows characteristics of the groups.
*POG (period of Gestation), BMI (body mass index); +Comorbidity given in (n) (hypothyroidism, anaemia, gestational diabetes mellitus, intrahepatic cholestesis of pregnancy, ovarian cyst, morbid obesity and twin pregnancy)

RR, Mean±SD	Music group (n=30)	Non music group (n=30)	Mann-Whitney U Test (2 tailed) Z score	p-value
Evening before LSCS#	15.483±1.213	15.433±1.135	0.19959	0.84148
Preoperative	16±1.232	16.066±1.377	0.21437	0.83366
Intraoperative	15.966±1.217	15.733±1.285	0.68008	0.4965
PACU* (90 min after LSCS)				
0 minute	15.566±1.04	15.5±1.306	-0.02218	0.984
10 minutes	15.533±0.937	15.533±1.224	-0.13306	0.89656
20 minutes	15.466±1.008	15.5±1.252	-0.80575	0.41794
30 minutes	15.533±0.937	15.633±1.272	-0.3844	0.70394
45 minutes	15.6±1.037	15.833±1.288	-0.50267	0.61708
60 minutes	15.6±1.003	16.1±1.028	-1.96633	**0.04884**
2 hours	15.9±1.094	16.185±1.178	-1.55026	0.12114
3 hours	16.48±0.822	16.647±0.931	-0.65933	0.50926

[Table/Fig-2]: Shows perioperative outcome on Respiratory Rate (RR).
#LSCS: Lower segment caesarean section; *PACU: Postanaesthesia care unit

The study observed statistically significant differences in VAS at 1, 2 and 3-hour PACU [Table/Fig-7]. However, there were no differences in VRS and NRS between groups [Table/Fig 8,9]. VAS was lower in the music group at PACU 1, 2 and 3 hours as compared to control. The difference was found to be significant (p=0.0003, p=0.00152, p=0.02444) between groups [Table/Fig-7]. Time for first rescue analgesia was also assessed in the recovery room of PACU and found significant (p=0.01732) differences (29 mins) in favour of music therapy/medicine group [Table/Fig-10].

Parameters	Music group (n=30)	Control group (n=30)	Mann-Whitney U Test (2 tailed) Z score	p-value*
SpO_2 Mean±SD				
Evening before CS	98.7±0.702	98.766±0.679	-0.377	0.35197
Preoperative	98.9±1.062	99.1±0.884	-0.60616	0.54186
Intraoperative	99.6±0.563	99.5±0.731	0.23655	0.81034
PACU (from 90 min after LSCS)				
0 minute	99.633±0.808	99.433±0.971	0.62834	0.5287
10 minutes	99.6±0.621	99.266±1.142	0.79097	0.42952
20 minutes	99.5±0.777	99.333±0.884	0.61355	0.54186
30 minutes	99.5±0.776	99.266±0.907	0.88707	0.37346
45 minutes	99.333±0.884	99.2±0.761	0.88707	0.37346
60 minutes	99.1±0.959	98.966±0.718	0.8501	0.39532
2 hours	99.666±0.802	98.555±0.891	0.70321	0.48392
3 hours	98.36±0.638	98.47±0.799	-0.19219	0.8493

[Table/Fig-3]: Perioperative outcome data on Oxygen Saturation (SpO_2).
*No significant differences observed between groups

Heart rate, Mean±SD	Music group (n=30)	Non music group (n=30)	Mann-Whitney U Test (2 tailed) Z score	p-value
Evening before LSCS#	84.066±7.075	83±16.782	-0.40657	0.6818
Preoperative	92.8±16.251	98.766±14.328	-1.64846	0.09894
Intraoperative	90.433±17.468	95.066±18.639	-1.14579	0.25014
PACU* (90 min after LSCS)				
0 minute	78.333±13.919	84.6±13.061	-1.75195	0.08012
10 minutes	75.733±11.644	80.4±11.373	-1.15319	0.25014
20 minutes	76.333±13.386	79.766±11.589	-1.14579	0.25014
30 minutes	75.1±12.821	82.333±12.251	-2.20288	**0.0278**
45 minutes	73.4±10.956	81.066±10.559	-2.43204	**0.0151**
60 minutes	76.5±10.398	80.033±11.675	-2.18809	**0.02852**
2 hours	80.3±11.546	85.666±12.487	-1.63018	0.1031
3 hours	85.72±12.174	87.294±12.082	0.67906	0.4965

[Table/Fig-4]: Shows perioperative outcome data on Heart Rate (HR).
#LSCS: Lower segment caesarean section; *PACU: Postanaesthesia care unit

BP, Mean±SD	Music group (n=30)	Control group (n=30)	Mann-Whitney U Test (2 tailed) Z score	p-value*
Evening before CS SP	119.7±15.18	118.1±11.67	0.11828	0.90448
Evening before CS DP	79.1±9.091	75.83±6.73	1.35277	0.17702
Preoperative SP	127.1±16.43	126.6±10.11	-0.25873	0.79486
Preoperative DP	81.17±11.34	80.27±8.111	0.35483	0.72634
Intraoperative SP	108±12.1	106.3±9.934	0.36222	0.71884
Intraoperative DP	61.57±12.14	60.03±9.87	0.73922	0.4593
PACU (90 min after LSCS)				
0-minute SP	117.767±15.817	112.567±11.078	0.9462	0.34212
0-minute DP	72.2±13.105	69.5±8.712	0.79097	0.42952
10-minute SP	117.567±19.32	111.83±11.18	0.56181	0.57548
10-minute DP	70±14.042	68.333±9.739	0.21437	0.83366
20-minute SP	118.8±18.85	113.8±14.389	0.60616	0.54186
20-minute DP	70.7±14.159	67.133±12.02	0.80575	0.41794
30-minute SP	119.167±15.96	115.4±11.828	0.6653	0.50286

30-minute DP	71.966±11.198	70.4±10.327	0.70226	0.48392
45-minute SP	120.9±15.66	116.96±11.44	0.52485	0.69306
45-minute DP	72.466±13.441	71.7±10.402	-0.10349	0.92034
60-minute SP	122.366±12.47	120.066±8.65	0.35483	0.72634
60-minute DP	75.466±10.758	74.5±9.655	0.39179	0.69654
2-hour SP	126.733±14.54	124±9.417	0.00799	0.99202
2-hour DP	78.133±10.149	77.407±8.111	0.19978	0.84148
3-hour SP	130.12±9.954	125.353±9.11	0.65343	0.5157
3-hour DP	80.08±9.954	78.176±10.61	0.44844	0.65272

[Table/Fig-5]: Perioperative outcome data on Blood Pressure (BP).
*No significant differences observed between groups; SP: Systolic pressure; DP:Diastolic pressure

MABP, Mean±SD	Music group (n=30)	Control group (n=30)	Mann-Whitney U Test (2 tailed) Z score	p-value*
Evening before CS	91.6±11.143	89.6±7.449	0.21437	0.83366
Preoperative	99.3±13.44	97.266±9.108	0.51745	0.60306
Intraoperative	80.266±11.555	78.466±10.811	0.8501	0.39532
PACU (90 min after LSCS)				
0 minute	89.2±14.413	85.666±10.293	0.71704	0.47152
10 minutes	87.366±16.245	81.866±9.783	1.01273	0.3125
20 minutes	88.333±19.395	82.866±12.918	0.73183	0.4654
30 minutes	89.1±12.449	85.7±11.256	0.90185	0.36812
45 minutes	87.6±13.168	86.533±10.19	-0.0961	0.92034
60 minutes	91.233±10.676	89.733±8.378	0.58398	0.56192
2 hours	94.066±10.075	92.555±7.909	0.23973	0.81034
3 hours	97.08±10.832	92.411±12.278	0.83281	0.40654

[Table/Fig-6]: Perioperative outcome data on Mean Arterial Blood Pressure (MABP).
*No significant differences observed between groups

VAS, Mean±SD	Music group (n=30)	Non group (n=30)	Mann-Whitney U Test (2 tailed) Z score	p-value
Evening before LSCS#	0	0	NA	NA
Preoperative	0	0	NA	NA
Intraoperative	0	0	NA	NA
PACU* (90 min after LSCS)				
0 minute	0	0	NA	NA
10 minutes	0	0.033±0.182	-0.21437	0.83366
20 minutes	0	0.07±0.267	-0.43614	0.65994
30 minutes	0	0.123±0.519	-0.43614	0.65994
45 minutes	0.12±0.357	0.463±0.733	-1.85545	0.06288
60 minutes	0.643±0.81	1.51±1.105	-3.61479	**0.0003**
2 hours	1.88±1.001	2.763±1.045	-3.17245	**0.00152**
3 hours	3.077±0.487	3.471±0.732	-2.24803	**0.02444**

[Table/Fig-7]: Shows perioperative outcome data on Visual Analogue Scale (VAS).
#LSCS: Lower segment caesarean section; *PACU: Postanaesthesia care unit

Predictive value of time for first rescue analgesia was evaluated using the ROC curve analysis. The area under ROC curve of time for first rescue analgesia was 0.6794. The lower and upper bound 95% Confidence Interval was 0.56-0.80; p-value (two tailed) was 0.004. The best compromise was obtained with a cut-off value of 150 minutes for rescue analgesia with a sensitivity and specificity of 90% and 43.33%. ROC curve analysis revealed 150 minutes as best cut-off time for rescue analgesia [Table/Fig-11,12]. The study did not observe any adverse effect (mortality, morbidity, complications, etc.,) in any patient in either of the groups during the study period.

VRS, Mean±SD	Music group (n=30)	Control group (n=30)	Mann-Whitney U Test (2 tailed) Z score	p-value*
Evening before CS	0	0	NA	NA
Preoperative	0	0	NA	NA
Intraoperative	0	0	NA	NA
PACU (90 min after LSCS)				
0 minute	0	0	NA	NA
10 minutes	0	0.033±0.182	-0.21437	0.83366
20 minutes	0	0.066±0.254	-0.43614	0.65994
30 minutes	0	0.066±0.254	-0.43614	0.65994
45 minutes	0.133±0.346	0.4±0.498	-1.76674	0.07672
60 minutes	0.7±0.466	0.966±0.49	-1.56715	0.11642
2 hours	1.166±0.379	1.384±0.496	-1.38823	0.16452
3 hours	1.792±0.415	1.882±0.332	-0.47633	0.63122

[Table/Fig-8]: Perioperative outcome data on Verbal Rating Scale (VRS).
No pain (0), Mild pain (1), Moderate pain (2); *No significant differences observed between groups

NRS, Mean±SD	Music group (n=30)	Control group (n=30)	Mann-Whitney U Test (2 tailed) Z score	p-value*
Evening before CS	0	0	NA	NA
Preoperative	0	0	NA	NA
Intraoperative	0	0	NA	NA
PACU (90 min after LSCS)				
0 minute	0	0	NA	NA
10 minutes	0	0.333±1.826	-0.21437	0.83366
20 minutes	0	0.666±2.537	-0.43614	0.65994
30 minutes	0	1±4.026)	-0.43614	0.65994
45 minutes	1.333±3.457)	4.5±6.345	-1.79631	0.07186
60 minutes	8.666±6.814)	18.833±9.62	-1.95894	0.051
2 hours	20.666±8.683)	23.703±7.544	-1.67013	0.09492
3 hours	28.6±3.685)	30.588±6.586	-0.73031	0.4654

[Table/Fig-9]: Perioperative outcome data on Numeric Rating Scale (NRS).
Scale 0-100; *No significant differences observed between groups

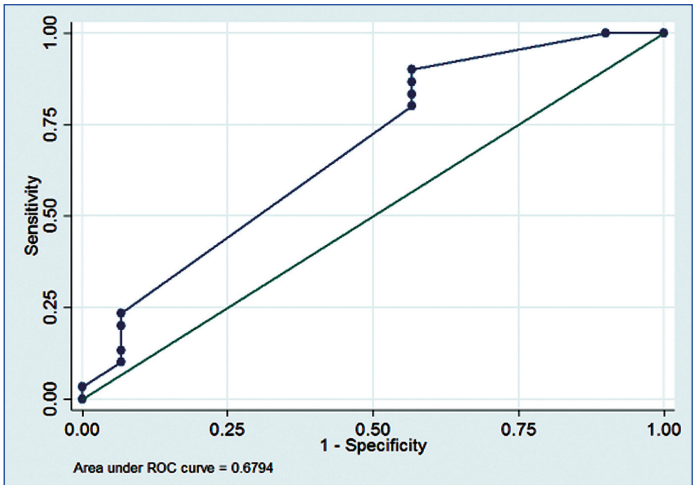
Time for first rescue analgesia in minutes	Music group (n=30)	Non music group (n=30)
Mean±SD	181±30.09	152±46.56
Mann-Whitney U Test (2 tailed) Z score	2.38029	
p-value	**0.01732**	

[Table/Fig-10]: Shows comparison of time for first rescue analgesia.

Cut point (min)	Sensitivity	Specificity	Correctly classified	LR+	LR-
(≥60)	100.00%	0.00%	50.00%	1	0
(≥120)	100.00%	10.00%	55.00%	1.1111	0
(≥150)	**90.00%**	**43.33%**	**66.67%**	**1.5882**	**0.2308**
(≥165)	86.67%	43.33%	65.00%	1.5294	0.3077
(≥170)	83.33%	43.33%	63.33%	1.4706	0.3846
(≥180)	80.00%	43.33%	61.67%	1.4118	0.4615
(≥190)	23.33%	93.33%	58.33%	3.5	0.8214
(≥195)	20.00%	93.33%	56.67%	3	0.8571
(≥210)	13.33%	93.33%	53.33%	2	0.9286
(≥240)	10.00%	93.33%	51.67%	1.5	0.9643
(≥255)	3.33%	100.00%	51.67%	0	0.9667
(>255)	0.00%	100.00%	50.00%	0	1

Observations	Area (AUC under ROC)	Std. Err.	95% Confidence interval
60	0.6794	0.0626	0.56-0.80

[Table/Fig-11]: Shows sensitivity and specificity of time for first rescue analgesia.



[Table/Fig-12]: Shows ROC graph of music and non music variables of time for first rescue analgesia in minutes.

DISCUSSION

Music played through the application of headphone (to prevent any noise disturbance to operating team) during operation may ameliorate patient anxiety and improve cardiorespiratory parameters through its effect on autonomic and central nervous system. This study assessed the effects of perioperative music on postoperative pain besides comparing vital parameters (cardiovascular and respiratory), time for rescue analgesia and adverse effects in women undergoing caesarean section delivery under spinal anaesthesia in a teaching hospital. This study was quite similar to studies of Nilsson U et al., [11,13]. However, there were some differences like caesarean section under spinal anaesthesia and perioperative Indian music. Nilsson U et al., (2001 and 2003) used intraoperative music during general anaesthesia in the first two hours after surgery. This study had more impact, as confounding/modifying factors were comparable between groups. This study observed beneficial effect of music on pain (VAS), HR, RR and time for first rescue analgesia (delayed by 29 minutes) in postoperative period. This observation was similar to many previous studies [27-29]. These researchers also reported greater haemodynamic stability, including HR similar to these study findings in patients administered music during surgical procedure. This study did not find any differences in BP or mean arterial pressure. Other studies also found similar results with no changes in BP with music [3,29]. These findings support that music has a positive impact on physiology (HR, RR, etc.,) as well as neuropsychology (pain; VAS) of women undergoing LSCS delivery under spinal anaesthesia.

On comparing HR preoperatively and just after spinal anaesthesia there was no significant difference. However, 30 minutes after PACU (90 minutes after caesarean section) the HR in music group started falling until 60 minutes PACU consistently and significantly as compared to the control. Lowering of HR with music on patients undergoing surgery under general anaesthesia also reported by other researchers [28]. Various authors have studied the effects of music on pain, anxiety, cardiovascular parameters, hormonal parameters, neurotransmitter levels and doses of sedatives and analgesics [3,9,12,30,31]. Various researches reported a decrease in BP peri surgery when patients were allowed to select music of their choice [29,32]. However, in contrast to other studies, present study failed to show any effect on BP, mean blood pressure or SpO_2 [29,33]. Similar to present study many other studies also found a decrease in the HR in postoperative period in women who received music therapy/medicine [30]. This suggests that music probably distracts the attention and decreases the level of anxiety as well as pain thus offers relaxation. This study did not find a significant difference in the SpO_2 levels of women. However, many other studies found an increase in SpO_2 level in music group [34].

The best compromise was obtained with a cut-off value of 150 minutes for rescue analgesia with a sensitivity and specificity of 90% and 43.33%. ROC curve analysis revealed 150 minutes as best cut-off time for rescue analgesia. This suggests one can wait up to 150 minutes PACU for second dose of analgesia. Although findings of cut-off duration of 150 minutes PACU was highly significant (p-value 0.004) but as area under ROC was only 0.6794 (against accepted >0.8) we cannot recommend practice intervention at 150 minutes PACU. More studies are needed with a greater number of cases before recommending standard practice guideline.

Limitation(s)

The limitation of the study was inability to carry out estimation of various neurotransmitters as well as hormones (catecholamines, cortisol, oxytocin, serotonin, etc.,) involved in cardiorespiratory, pain and stress response of patients and correlating with music therapy/medicine.

CONCLUSION(S)

In conclusion, it was found that music therapy/medicine during LSCS has beneficial effect during postoperative period on HR, RR, VAS and time to requirement for rescue analgesia but no effects on SpO_2 levels, BP, mean arterial pressure, VRS and NRS. Music is a non invasive and non pharmacological interventional tool and is effective to achieve haemodynamic stability, lesser pain (VAS) and higher time to rescue analgesia in women undergoing LSCS delivery. We have also determined cut-off time for second dose analgesia as 150 minutes PACU. Based on these results and being an inexpensive easy to use method music therapy/medicine may be recommended perioperatively with LSCS delivery. But we recommend for more study with large number of women before inclusion as practice guideline.

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